UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/542,942	03/31/2000	Stephen S. Ho	M0635/7065 (RJK)	4931

7590   04/07/2004

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EXAMINER
ABDULSELAM, ABBAS I

ART UNIT	PAPER NUMBER
2674	

DATE MAILED: 04/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	09/542,942	HO ET AL.
	Examiner	**Art Unit**
	Abbas I Abdulselam	2674

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE **3** MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 February 2003*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5-8,10-27,30-33 and 35-66* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-8,10-27,30-33 and 35-66* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____ .

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application)
since a specific reference was included in the first sentence of the specification or in an Application Data Sheet.
37 CFR 1.78.

    a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific
reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☒ Interview Summary (PTO-413) Paper No(s). *15* .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

Response to Arguments

1.   Applicant's arguments with respect to claims 1-2, 5-8, 10-27, 30-33 and 35-66 have been

considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

Claims 1-2, 5-8, 10-27, 30-33 and 35-66 rejected under 35 U.S.C. 103(a) as being

unpatentable over Shih et al. (USPN 6421048) in view of Xavier (USPN 6407748).

Regarding claims 1, 10, 26, 35, 43, 47, 52, and 62, Shih et al. (herinafter "Shih") teaches

a user, a hepatic interface device (10), virtual object (26), an interaction with a virtual object, and

a force feedback produced by the haptic rendering process. See col. 5, lines 13-16. Shih teaches

the virtual object (26) being implemented as a volume of voxels (78) with each voxel and the

volume storing a density value and a density threshold value respectively. See col. 15, lines 7-

45. Shih further teaches a virtual surface (25) of a virtual object (26) and a virtual tool guided by

the user using haptic interface device (10). See Fig 2B. Shih teaches tool points that are stored in

a separate point array of local points intended to represent the tool. See col. 26, lines 29-35

Furthermore, Shih teaches a scenario where a user is moving the haptic interface device so that

the virtual tool (28) is moving toward the virtual surface 25 of the virtual object (26). See Fig

5A. In addition, Shih teaches collision detection between a virtual tool (28) and a virtual object

(26) and the resulting forces that form a collision, depth of penetration and direction of the

impact. See col. 18, lines 61-67. Shih further teaches calculations of a vector (101) from a point

(S3, S4) from direction of a movement and points of penetration. See Fig 5 (B-C). Moreover,

Shih teaches haptic rendering process (16) that determines the vector (101) and an interaction

force to be applied with respect to a user movement of the virtual tool and the resulting feedback

force. See col. 14, lines 41-68. Shih also teaches a CAD system, the haptic interface device

sensing six degree of freedom and haptic rending process (16) determining geometry of the

virtual surface. Shih teaches haptic the rendering process in terms of location (98), surface (25)

and using a path for the tool (28). Shih also teaches the rotation of a virtual tool (28) or moving

the tool in different angels. See col.1, lines 24-35, Fig 5C, Fig (8A-C), col. 8, lines 58-63, col.10,

lines 43-46. Shih does not teach the use of "volume hierarchies". However, Xavier teaches

hierarchical bounding volume representations (12, 13) as shown in Fig. 1.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify to modify shih's modeling application to incorporate Xavier's

hierarchical bounding volume representations (12, 13) as illustrated in Fig. 1. One would have

been motivated in view of the suggestion in Xavier that the hierarchical bounding volume

representations (12, 13) as utilized in Fig. 1 can be applied to satisfy the desired use of "volume

hierarchies". The use of "hierarchical bounding volume representations" helps function a system

for modeling interactions as taught by Xavier.

Moreover, Xavier teaches contact determination in terms of binary-space partitioning tree

(BSPtree) (col. 1, lines 58-61).

In addition, Shih teaches (Fig. 4) a hepatic rendering process between a virtual tool and a virtual object as shown in Fig. 4, which includes a step of determining a geometry for the virtual surface (72). It would have been obvious that determination of geometry for the virtual surface (72) is functionally equivalent to the desired "generation of a posture map" and "guide zones". Further Shih teaches a surface direction vector of a point and surrounding density evaluation points. See Fig. 12. Shih teaches that the vector and density computations are used to project any point within the virtual object (26) to the virtual surface (25) of the virtual object (26) in order that the potential surface contact point (226) is calculated. See col. 17, lines 46-54 and Fig. 12. It would have been obvious that density evaluations and contact point determinations equivalently provide the desired "niceness factor" or "snap fit regions".

Regarding claims 18, and 37-38, Shih teaches a way to locate the virtual surface (25) in terms of binary search. See Fig 14 (A-C).

Regarding claims 5 and 30, Shih teaches the haptic rendering process (16) and the amount of penetration into the virtual object (26). See col. 10,lines 35-36.

Regarding claim 6, Shih teaches a virtual representation of multiple discrete points. See col. 3, lines 25-30.

Regarding claim 11, Shih teaches the use of CAD system in connection to virtual reality technique. See col. 1, lines 24-42.

Regarding claim 20, Shih teaches a region of volume as it relates to a gradient (80) for a virtual object (26) including a tool point (224) and a final tool surface contact point (226). See Fig 13.

Regarding claim 36, Shih teaches a voxel value at any point, which gives an indication of

the penetration depth and the shortest distance between the voxel (78) and the surface (86) of the

volume. See col. 16, lines 16-18.

Regarding claim 39, Shih teaches a haptic interface location and the movement of the

virtual representation based on geometry of the surface. See col. 3, lines 30-37.

Regarding claims 23 and 40-41, Shih teaches the points of the virtual tool (28) in terms of

algebraic equation expressed in 3-D shape in a virtual environment. See col. 7, lines 38-44.

Regarding claims 8, 21-22, 24-25, 42, 54-60 and 65-66, Shih teaches a virtual tool (28)

which is a software object determining if contact has occurred with a virtual object (26) and

determining the surface direction vector (101). See col. 5, lines 53-56.

Regarding claims 2, 27, 53 and 63, Shih teaches an interface device (10) sensing six

degree of freedom and haptic rendering process (16) determining geometry of the virtual surface.

See col. 8, lines 58-63 and col. 10, lines 43-46.

Regarding claims 7, 12-17, 19, 31-33, 44-46 and 49-51, Shih teaches a volume storing a

density threshold value and points having a threshold value greater or less than the density

threshold. See col. 15, lines 21-34.

Regarding claim 48, Shih teaches a three dimensional configuration in the virtual space

and a virtual tool (28) penetrating the virtual object (26). See Fig 1 & Fig 2B.

Regarding claims 61 and 64, Shih teaches a haptic rendering process (16) in terms of

haptic location (98), surface (25) and using path for the tool (28). Shih also teaches the rotation

of a virtual tool (28) or moving the tool in different angles. See Fig 5C.

Conclusion

3.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure. The following art is used for further reference.

U.S. Pat. No. 6,404,913 to Ohki

4.   Any inquiry concerning this communication or earlier communication from the examiner

should be directed to **Abbas Abdulselam** whose telephone number is **(703) 305-8591.** The

examiner can normally be reached on Monday through Friday (9:00-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, **Richard Hjerpe**, can be reached at **(703) 305-4709.**

Any response to this action should be mailed to:

Commissioner of patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314

Hand delivered responses should be brought to crystal park II, Crystal Drive, Arlington,

VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology center 2600 customer Service office whose telephone number is (703) 306-0377.

Abbas Abdulselam

Examiner

Art Unit 2674

March 26, 2004

XIAO WU
PRIMARY EXAMINER

	Application No.	Applicant(s)
Interview Summary	09/542,942	HO ET AL.
	Examiner	Art Unit	
	Abbas I Abdulselam	2674	

All participants (applicant, applicant's representative, PTO personnel):

(1) *Abbas I Abdulselam*.   (3)_____.

(2) *Mark Johannes*.   (4)_____.

Date of Interview: *18 March 2003* .

Type: a)☒ Telephonic   b)☐ Video Conference
       c)☐ Personal [copy given to: 1)☐ applicant   2)☐ applicant's representative]

Exhibit shown or demonstration conducted: d)☐ Yes   e)☐ No.
       If Yes, brief description: _____ .

Claim(s) discussed: _____ .

Identification of prior art discussed: _____ .

Agreement with respect to the claims f)☒ was reached. g)☐ was not reached. h)☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: *Applicant argued about the finality of the last office action and the examiner agreed.Hence the finality of the last office action is withdrawn.* .

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

_____
Examiner's signature, if required